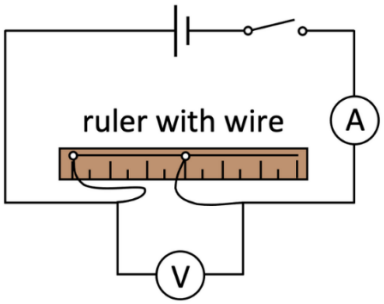
MJSO 2025 - Marking Scheme

Item		Description	Remarks	Mark
Section A: Biology (34 marks)				
1	a	Leaves A are green while leaves B are purple/red. As the leaves have different photosynthetic pigment their chromatogram will have a different profile	Accept any correct variation to this hypothesis.	2
	b	Pigments absorb the light energy necessary for powering photosynthesis.		2
	ci	Two chromatograms with outline of bands and well labelled.	1 mark for each chromatogram.	2
	ii	The colours of the pigments and the movement of the pigments is different in chromatogram A and chromatogram B		2
	iii	Justification depends on the chromatogram obtained and the hypothesis made.		2
	iv	Ink is soluble in the solvent and so the ink pigments will contaminate the chromatogram. Pencil (graphite) is not soluble.	1 mark each statement	2
	v	The pigment may dissolve in the solvent in the test tube resulting in poor separation of pigments		2
	d	Values of solvent line for leaves A and B Appropriately filled in sheet according to chromatogram.		2
	ei	Leaves are green as the range of light waves are not absorbed by the chlorophyll pigments. They are reflected back and therefore we see leaves as green.	1 mark for each statement	2
	ii	In the absorption spectrum graph Chlorophyll a and b peak in the 400 – 500nm and in the 600 – 700nm. The action spectrum graph has two peaks at the 400 – 500nm and the 600 – 700 nm. Therefore, where the chlorophylls absorb most light, in the region of certain wavelengths there is most photosynthesis occurring. Showing that the role of chlorophylls is to capture light energy to perform photosynthesis.	1 mark 1 mark 1 mark 1 mark	4

Item		Description	Remarks	Mark
1	fi	Title of graph correctly labelled axes Well distributed scale of values Plotting of graph	1 mark 1 mark 1 mark 2 marks	
	ii	At a closer distance the production of oxygen is high which drops off sharply as the light is moved further away from the plant. At 25 to 35cms the oxygen produced is constant (plateau). This means at closer distances the rate of photosynthesis is high but decreases as the light source is moved further away from the plant Until the light becomes a limiting factor as it limits the rate of photosynthesis.	1 mark 1 mark 1 mark 1 mark	4
	iii	Temperature Carbon dioxide availability Accept water availability and chlorophyll concentration	1 mark 1 mark	2
Section B: Chemistry (33 marks)				
2	a	HCl (aq) + NaOH (aq) → NaCl (aq) + H_2O (l)	1 mark for formulae 1 mark for balancing 1 mark for state symbols.	3
	b	RFM(NaCl): 23 + 35.5 = **58.5** Qty of NaCl in moles: 58.5 g → 1 mole 0.25 g → (0.25 x 1)/58.5 = **0.00427** moles of NaCl Volume of HCl(aq) needed: 0.5 mol HCl → 1000 cm^3 0.00427 mol HCl → (1000 x 0.00427)/0.5 = **8.547 cm^3** = **8.5 cm^3** Volume of NaOH (aq) needed: 1 mol NaOH → 1000 cm^3 0.00427 mol NaOH → 1000 x 0.00427 = **4.273 cm^3** = **4.3 cm^3**		1 2 2 2
	c	Acids and alkalis are **corrosive**.		1

Item		Description	Remarks	Mark
2	d	Wear safety specs. Wear latex gloves.	Accept "Wear a lab coat." and other valid H&S considerations related to the prevention of the corrosive behaviour of these substances.	1 1
	e	1. Measure 4.3 cm^3 of NaOH solution in a clean measuring cylinder and transfer the solution into the beaker. 2. Measure 8.5 cm^3 of HCl solution in a clean measuring cylinder and transfer into the beaker containing the sodium hydroxide solution. 3. Weigh the empty evaporating basin and note its mass in grams. 4. Mix the two solutions well using a glass rod and then transfer the solution to the evaporating basin. 5. Distilled water was used to make sure that all the solution was washed from the beaker, the measuring cylinder and the glass rod into the evaporating basin. 6. Place the evaporating basin and solution on a pipe clay triangle/ wire gauze and tripod and then use a Bunsen burner to evaporate the water from the solution until dry sodium chloride is obtained. 7. Weigh the evaporating basin and sodium chloride until constant mass is achieved.	1 mark for each step.	7
	f	mass of basin mass of basin + solid sodium chloride mass of sodium chloride	Apply follow through.	1 1 1
	g	• All glassware was washed with distilled water several times to remove impurities and then dried using a lint free paper towel. • When filling the measuring cylinder with the respective solutions the volume was read at eye level to avoid parallax errors. • The volume of the solutions was read at the bottom of the meniscus. • The solution was heated until all the solvent was evaporated. This was ensured by heating to constant mass. • Heat was controlled towards the end to avoid the salt from spitting out of the basin.	Any three.	3

Item		Description	Remarks	Mark
2	h	Percentage yield = (actual yield / theoretical yield) x 100 Calculation Answer	 >= 80% 3 marks, >= 70% 2 marks, < 70% 1 mark	1 1 3
	i	Volumes of solutions can be measured using equipment that is more accurate than a measuring cylinder. A burette is a great way to do this. / A measuring cylinder that has finer gradations.		2
Section C: Physics (33 marks)				
3	a	Ohm (Ω)		1
	b		1 mark for ammeter connected in series 1 mark for voltmeter connected in parallel 2 marks for power supply and connecting wires	4
	c	Set up the circuit with the power supply, ammeter in series, and voltmeter in parallel across the wire. Attach the wire to a ruler and use crocodile clips to connect it to the circuit at different lengths (e.g., 10 cm, 20 cm, 30 cm, up to 100 cm). Record the voltage (V) and current (I) for each length. Calculate the resistance using **R = V/I** for each length.	1 2 1 1	5

<table>
<tr><th colspan="2">Item</th><th>Description</th><th>Remarks</th><th>Mark</th></tr>
<tr><td>3</td><td>d</td><td>
<table>
<tr><th>Wire Length (cm)</th><th>Voltage (V)</th><th>Current (A)</th><th>Resistance (R = V/I) (Ω)</th></tr>
<tr><td>10</td><td></td><td></td><td></td></tr>
<tr><td>20</td><td></td><td></td><td></td></tr>
<tr><td>30</td><td></td><td></td><td></td></tr>
<tr><td>40</td><td></td><td></td><td></td></tr>
<tr><td>50</td><td></td><td></td><td></td></tr>
<tr><td>60</td><td></td><td></td><td></td></tr>
<tr><td>70</td><td></td><td></td><td></td></tr>
<tr><td>80</td><td></td><td></td><td></td></tr>
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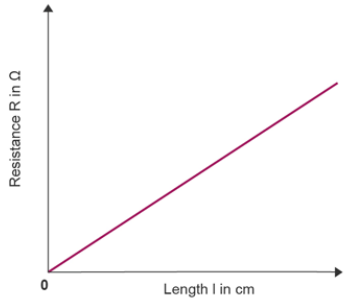
</td><td>1 mark for each column including wire length, voltage and current.
2 marks for calculating resistance in the last column.</td><td>5</td></tr>
<tr><td></td><td>e</td><td> 
</td><td>1 mark for Title and Axis labels

2 marks for scale (more than 70% of graph on both axes)

2marks for plotting

1 mark for straight line</td><td>6</td></tr>
<tr><td></td><td>f</td><td>voltage increases,
current decreases,
resistance increases</td><td>1
1
1</td><td>3</td></tr>
<tr><td></td><td>g</td><td>It supports Ohm's Law indirectly by demonstrating that resistance is proportional to length.</td><td></td><td>2</td></tr>
<tr><td></td><td>h</td><td>Inaccurate length measurements,
Temperature changes,
Resistance at the contact points,
Fluctuating current/ voltage,</td><td>ANY THREE or other valid possible answer</td><td>3</td></tr>
<tr><td></td><td>i</td><td>The experiment confirms that resistance is proportional to wire length.</td><td></td><td>2</td></tr>
<tr><td></td><td>j</td><td>No.
Copper has a low resistance.</td><td>1
1</td><td>2</td></tr>
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